LAND-STRUCTURE SPLIT TAX SYSTEM IN KOREA: ANALYSES FOCUSING ON THE RELATIONSHIP BETWEEN TAX RATIO OF STRUCTURE TO LAND AND AREA RATIO OF IT.

By

LEE, Jaeho

THESIS

Submitted to

KDI School of Public Policy and Management

in partial fulfillment of the requirements

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Committee in charge:

Professor Man CHO, Supervisor

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ABSTRACT

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The purpose of this paper is to see if the two-rate tax shrinks supply of building spatial area per land. For that I used panel data of fifteen different cities and provinces. The government of South Korea has changed its real estate tax system from two-rate tax to compounded tax for housing but not for commercial building. Therefore, in this paper, it is tested whether changed tax system encouraged or discouraged the supply of spatial area for housing. For the tax system of the commercial building is consistent with the same period, it is tested whether the tax ratio between land and improvement affects the supply of spatial area. The result, it is revealed that either lower building tax or higher building tax encourages capital intensity. Therefore, we can say that to improve capital intensity; in other words, to use land more efficiently, the government has to collect more tax on land and less on building. Policy implication is drawn.

Key word: two-rate tax, building to land tax ratio, land use intensity

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I. Introduction

A. Motivation

Since South Korea has been established, it has experienced explosive GDP growth. In the case of land price, surprisingly, the growth rate was even much faster than that of GDP. It is obvious that higher housing price must be attributed to high price level of land not to the price of building itself. Nowadays, in Seoul, South Korea, it is very tough for a salary man to buy a house by himself without aid because it would take almost 11 to 16.2 years with only labor income, and without any expenditure.[1] Thus, those who do own a house and who do not will be situated under very different situations, even when they have the same levels of income.

Therefore, previously, many presidential regimes tried to constrain the soaring housing price by controlling either the supply side or the demand side and yet have not succeeded. In 2007, according to the administration, for the last 40 years, the majority of government policies can be summarized as three points: constraining the demand, de-regulation or business activation, and housing welfare policy.[2] On the contrary to the government policies, it is said that the regulation oriented policies are not suitable for any market which is composed as supply and demand due to the distortion by regulations. Market oriented policy has been accepted by many scholars for a long time as the Bible in economics.

[1] Referring KB Bank statistics of June 2011, on average, household income class corresponding to its mean housing price in Seoul. For all cities, it ranges from 5.2 to 6.8 years.

[2] Gukjeong Briefing Teukbyeolgihoek team, "*Daehanminguk Budongsan 40Nyeon* (40 years of real estate in the Republic of Korea)," (Seoul: Hansmedia, 2007), 14

Direct control of the housing price by manipulating supply and demand seems meaningful; however, the government is not likely to seriously take into account that land and house have to be considered separately. The problem begins from here, because land and buildings are considered as a single unit when real estate policy is discussed; however, it is composed of very different two factors: land and improvement. In the other words, land and buildings have different traits; for instance, land can never be moved, destroyed, produced or depreciated, but buildings can. Then, in which way should the real-estate policy be changed? And what method should be applied?

B. Tax on Real Estate

The Rho's administration of South Korea initiated a new real estate policy which can be summarized as heavier tax on real estate, wishing that the price be stabilized. Tax is quite a controversial issue in almost every state; especially real estate tax in South Korea. The new real estate tax which was introduced by the Rho's government in South Korea is based on Henry George's idea: single land tax. Henry George's single land tax is based on a view that any kind of tax on artificial production discourages the will to work but a tax on land or natural resources does not discourage it; meaning that a tax on an inelastic good is neutral.

Many different opinions have been raised regarding single land tax claim. The tax on land value is generally considered as a desirable tax or lesser of the worst. In an interview with herald times, Milton Friedman[3] answered a question of interviewer:

> "I find income tax totally antagonistic to true free enterprise. Can we run the country without income tax?" and the answer was "….So the question is, which are the

[3] 1976 Novel prize laureate in economics.

least bad taxes? In my opinion the least bad tax is the property tax on the unimproved value of land, the Henry George argument of many, many years ago."[4]

William Vickrey[5] also said that

> "The property tax is, economically speaking, a combination of one of the worst taxes-the part that is assessed on real estate improvements and in some cases to a limited extent on personality-and one of the best taxes-the tax on land or site value."[6]

The ground of the two Novel laureates is that there would be no excess burden by taxation if we assume that the total amount of land is fixed. On the other hand, property tax could affect construction activities for building space supply; in other words, it causes excess burden.

The point raised by the Novel prize laureates is exactly repeated by Denise DiPasquale and William C. Wheaton[7]. They suggested a conceptual framework in the markets for real estate assets and space. They analyzed real estate market and concluded that price of real estate is affected by regulations: tax treatment of real estate, long-term interest rate and availability of construction financing. In this analysis, the property is not divided into land and building, thus both are applied at the same rate of tax. Therefore, this framework would not be adequate to see what actually happened in the Rho's administration's real estate policy and how the tax worked in the real estate market[8]; by levying tax on real estate,

[4] "Milton Friedman Interviewed: The Times Herald, Norristown, Pennsylvania; Friday, 1 December, 1978," http://www.cooperativeindividualism.org/friedman-milton_interview-1978.html (accessed Oct 20, 2011)

[5] 1996 Novel prize laureate in economics

[6] Kenneth C. Wenzer, ed., *Land Value Taxation: The Equitable and Efficient Source of Public Finance* (New York: M.E.Sharpe, Inc., 1999), 17.

[7] Denise DiPasquale and William C. Wheaton, "The Markets for Real Estate Assets and Space: A Conceptual Framework," Journal of the American Real Estate and Urban Economics Association 20, no.1 (1992): 181-197.

[8] Because previous government changed its housing property tax system from separated taxation to aggregated taxation.

housing price went up and excess burden arose-which would not have been necessary if tax was levied on land itself.

Referring Henry George, Milton Friedman, and William Vickrey it seems desirable if we can separate structure from land so that the government increases tax rate on land more than that on structures. In that sense, Wallace E. Oates and Robert M. Schwab presented empirical evidence of the two-rate tax with a case from the city of Pittsburgh. The city's property tax system was restructured in 1979 and 1980 tuning the tax ratio between land and improvement as five to one. It is not easy to separate this restructured tax scheme effect from other economic events; however, the empirical evidence of Pittsburgh shows outstanding results compared to the other fourteen cities in their sample. Pittsburgh indicated a remarkable performance; the real value of building permits on an annual basis rose by some 70 percent in the 1980s relative to the twenty-year period preceding the tax reform.[9]

C. Two-Rate Tax on Land and Improvement

Jan K. Brueckner(1999) analyzed what impact would occur if split-tax was levied with different tax rate on land and improvement instead of property tax imposing the same rate on land and improvement. And he found that property tax induces urban sprawl because the tax reduces intensity of land development and constructors can develop the margin of the

[9] Oates, Wallace E. and Schwab, Robert M, "The Impact of Urban Land Taxation: The Pittsburgh Experience." *The National Tax Journal* 50, no. 1 (1997): 8, http://ntj.tax.org/wwtax/ntjrec.nsf/dockey/893168271A5088AD85256863004A5942?OpenDocument (accessed September 19, 2011).

city at a relatively cheaper price than the center of the city. Reversely, the split-tax gives an incentive to increase intensity of land development limiting urban sprawl.[10]

In Korea, property tax and land tax were graded separately, but the tax rate between land and improvement was not much different. Throughout this study, I will try to see if whether George's idea-increase tax rate on land than improvement-has changed the capital intensity in South Korea or not. After that, the policy issues inquired to initiate the 'Two-Rate Tax' in practice and the expected result from that will be discussed. It would be meaningful if this study is helpful to initiate future policies in the real estate market and taxation, so that the central and local governments can provide better housing environments for the national and local people.

D. Research Question, Methodology, and Key Findings

As known it is, general property tax reduces the supply of spatial area; then, does the two-rate tax shrink supply of spatial area on the unit of land as well? For answering the question, I ran the regression analysis with fixed effect with fifteen different cities and provinces. The result, in case of house, building to land tax ratio has a negative effect on capital intensity; except for cities from 2001 to 2004. By the way, house price index has a positive relationship with capital intensity; except for provinces from 2003 to 2004. For commercial building, on the other hand, it is revealed that building tax rate and population density have negative correlation with capital intensity; however, regional GDP per capita has a positive relationship with it.

[10] Jan K. Brueckner, "Property Taxation and Urban Sprawl" (paper presented at the Lincoln Institute Conference on Property Taxation and Local Government Finance, Scottsdale, Arizona, January 16-18, 2000)

II. Integrated Tax VS. Two-Rate Tax

A. Taxation Principle and Single Tax Debate

Prior to discussing about two-rate tax, it is required to review the single tax because single tax is the origin of two-rate tax. It has been known in general that Henry George is the initiator of the single land tax; however, even before him, single land tax was already proposed. John Locke (1727~1781) argued to practice single land tax because land tax to the landlord is not passed through to the others. French physiocrat, François Quesnay (1694~1774) and Anne-Robert-Jacques Turgot, Baron de Laune (1727~1781) contended the same argument with George. Because they understood land tax is not passed through to the others; and taxes incur dead weight loss except for land tax and it burdens not only the landlord but also the entire society.[11]

George suggested following 4 conditions that should be considered in tax collecting for public revenue: [12]

> 1. That it bears as lightly as possible upon production—so as least to check the increase of the general fund from which taxes must be paid and the community maintained.

[11] Jungjeon LEE, "*Henry George eui sasang gua gueui togee dan il se e lon* (A thought of Henry George and his single land tax theory)," *Hangukjaejeonghakhoe, Je2jip* (Mar 1988): 112-13.

[12] Library of Economics and Liberty, "*Progress and Poverty An Inquiry into the Cause of Industrial Depressions and of Increase of Want with Increase of Wealth: The Remedy*," http://www.econlib.org/library/YPDBooks/George/grgPP34.html#_VIII.III.1 (accessed October 20, 2011).

2. That it be easily and cheaply collected, and fall as directly as may be upon the ultimate payers—so as to take from the people as little as possible in addition to what it yields the government.

3. That it be certain—so as to give the least opportunity for tyranny or corruption on the part of officials, and the least temptation to law-breaking and evasion on the part of the taxpayers.

4. That it bear equally—so as to give no citizen an advantage or put any at a disadvantage, as compared with others.

George's single land tax is based on two major principles which are 'Private Ownership' and 'Benefit-Received Principle'.[13] Regarding the private ownership, George's view is that it should be allowed to justify only as much as the amount of an individual labor contribution. However, increased land value is formed by the efforts of the whole society; therefore it has to be reaped by the society. E.R.A. Seligman refuted by saying that there is nothing produced by the effort of only one person, thus increased land value should be treated the same as the other goods; meaning that a product-which is made by the whole society in some sense-should be owned by an individual, so does increased land value. In the view of neoclassical economists, however, it is not reasonable letting the landlords take unearned income.[14] Unfortunately, however, if they are asked 'How we measure an individual's contribution to a single product?', then they would have no answer about it.

Secondly, as J.S. Mill criticized 'Benefit-Received Principle' and argued 'Ability to Pay Principle', so did Seligman. In other words, tax should be levied according to the tax

[13] Ibid.

[14] According to the classical economists, George's words can be written as 'MP_L = wage', namely, producers are paid by the amount of their contribution. However, Seligman says that the owner has to takes all.

payer's abilities. The second critic from E.R.A. Seligman still remains as a form of question like 'Should the government levy tax on income-ability to pay- or assets-benefit received?'

On top of that, there are some practical limitations. Following LEE, Seligman classified the single land tax's problems as four categories: financial problem, political problem, universality and equity, and economic problem.[15] First of all, financial problem; he argued that taxation should be flexible according to the governments' necessities. For example, in case of emergency, the single land tax policy cannot increase its revenue. In addition, 'a standard of assessment' is hardly estimated since the increased capital value is embedded in the land value through land improving work. Second, it is about political problem; if the government imposes the single land tax, those who do not have any piece of land have no reason to pay the tax to the government which may lose the loyalty of the national people and the government cannot exercise taxation as a policy tool for national interests, such as tariff for specific industries. Third, it violates universality and equity; it is unfair if tax should be only levied on land but not on any other assets, because land is also one element consisting of assets. On top of that, if the reason of single land tax that had to be collected is due to unearned income, why not the other unearned income? Fourth, it causes economic problem; it might be either sufficient or not according to the local governments' land value.

Kwack, Taewon, another critic, had five points regarding single land tax.[16] First, land value sharing by Henry George is not consistent with his logical thinking. If we thoroughly follow his idea, every nation has to share the earth beyond the boundary of a nation-state level. Second, land cannot be properly shared due to its characteristics in practical use. It is very

[15] Quoted in Jungjeon LEE ibid., 113 (Original source: Seligman, Edwin R.A. Essays in Taxation, (London: The Macmillan Co., 1919), 71)

[16] Taewon Kwack, "*Togee nun gong you dwe yeo ya ha nun ga?* (Should the private ownership of the land be outlawed?)," (Korea Economic Research Institute, 2005),176-9

appealing to call land as 'common inherit', however, it is impossible to allow every people to access freely to land because land is neither a free good nor a public good. Third, gratuitous confiscation is unacceptable in the view of justice. Even though it is right in principle, it is not acceptable to achieve the purpose at the expenses of the current land owners. Fourth, Georgist's argument has no logical background attaining for efficient and just land distribution. Market mechanism would be rarely working if hundred percent of rent is absorbed via taxation. Fifth, Henry George's predictions did not occur. Empirical evidence does not support his arguments: wage earners would be put under servitude or business cycle provoked due to land speculation and land monopoly.

It seems that there are some misunderstandings about Henry George's argument in Kwack's critics. George already recognized the first and second points he made above. In other worlds, George has recognized that sharing the land physically is impossible due to its unique characteristic. That is the reason he contended sharing land value as a form of public revenue.

Recently, Arthur O'Sullivan[17] summarized three critics of single land tax suggesting two alternatives to a single tax in his text book-urban economics.

> The single tax has been criticized for three reasons. First, the single tax would decrease the net return to the land-owner (net land rent) to zero, making the market value of land zero. In other words, the government would essentially confiscate the land. This strikes many people as inequitable. Second, if the net return on land were zero, landowners would abandon their land, leaving government bureaucrats to decide who uses the land. Therefore, the government land market is less likely to allocate land to its highest and best use. The third

[17] Arthur O'Sullivan, "*Urban Economics*," (New York: McGraw-Hil Irwin, 2009), 145

criticism is that it is difficult to measure land rent (and the appropriate tax). Most land has structures or other improvements, and it is difficult to separate the value generated by the raw land from the value generated by the improvements.

There are two alternatives to a single tax. Under a partial land tax, the tax rate is less than 100 percent. A partial land tax would leave landowners with a positive net return, so the land market would continue to be run by those who have a private interest in allocating land to its highest bidder. A second alternative is the two-rate tax, or the split property tax. Under the conventional property tax, land and improvements are taxed at the same rate. A three percent property tax is actually a three percent tax on land and a three percent tax on improvements. Under a two-rate tax, the tax rate on land may be nine percent, while the tax rate on improvements may be 1 percent. The two-rate tax is widely used in Australia and New Zealand. It is also used in some cities in Pennsylvania. By imposing a lower tax on improvements, the two-rate tax would increase investment in housing, buildings, and other improvements.

B. Inconsistent Policy Purpose

The Rho's administration of South Korea tried to decrease the price of land inspired by Henry George. However, what George wanted to do was not to stabilize the price of land, but he hoped to at least achieve economic justice and fairness through the taxation system and mitigate the gap between the richer and the poorer in the United States. According to his idea, definitely, the price of land will be equal to zero in theory when the government collects hundred percent of the potential rent. It might be attractive to the government officers to implement land tax as a tool of reducing the housing price; however, what the government increased is not the land tax but real estate tax. Consequently, it did not work well for the

time when the new policy was implemented. Nowadays even Georgists do not agree with the single land tax for the reasons by E.R.A. Seligman, Kwack and O'Sullivan made above. Nevertheless, the intuition from George is still alive. As it was seen from the augmentation regarding single land tax, it has some drawbacks that are hardly negligible. Nevertheless the flaw of the single land tax, two-rate tax was stemmed from the single land tax: collecting tax more from land and less from buildings.

C. Two-Rate Tax

The discussion of two-rate tax starts from resource allocation efficiency. According to Brueckner[18], property tax is composed with land tax and improvement at the same tax rate. While land tax is neutral[19], tax on improvement affects to the capital intensity due to its decreasing excess burden. In other words, resources can be allocated inefficiently-less intensive of capital- under property tax than pure land tax or two-rate tax.

Wallace E. Oates and Robert M. Schwab[20] analyzed empirically with the case of Pittsburgh's two-rate tax system and showed that Pittsburgh –when compared with the other fourteen cities– was outstanding among the fifteen cities regarding the average annual value of building permits in percentage change between 1960-1979 and 1980-1989. Only two out of fifteen cities had experienced increasing value –Pittsburgh 70.4% and Columbus15.4%– and the other thirteen cities were decreased by 34.63%.

[18] Brueckner. "Property Taxation and Urban Sprawl."

[19] Because land supply is fixed and it makes no excess burden, however, by Anderson, it is considered relatively more efficient. (i.e., generates a smaller marginal excess burden)

[20] Wallace E. Oates and Robert M. Schwab, "The Impact of Urban Land Taxation: The Pittsburgh Experience," *The National Tax Journal* 50, no. 1 (1997): 8., under "Introduction," http://www.lincolninst.edu/subcenters/property-valuation-and-taxation-library/dl/ oates_schw ab.p df (accessed September 19, 2011)

Roy Bahl[21] raised two major disadvantages in site value taxation corresponding to land in a part of two-rate tax. First problem is an assessment problem. For valuation of the land, total value of the property should first be evaluated and then the value of improvement has to be subtracted. Because there is a few evidence of vacant land sales in urban areas. This land value is likely to be evaluated in a subjective way than property valuation. Second problem is that the government has more chance having decreased tax amount by levying less tax on properties than before. Thus, the government might increase the tax rate on land so that the tax revenue can be the same as before; however, it is not an easy task to do so.

[21] Roy Bahl, Fiscal Decentralization, Revenue Assignment, And The Case For The Property Tax In South Africa, (Working Paper 01-7, 2001), 10.

III. Data

A. Data Collection

The materials referred here are from 'Annual Local Tax Statistics Report' by the Ministry of Public Administration and Security's board under 'Korean Statistical Information Service' (KOSIS)[22]. The tables and graphs[23] shown below is basically the relationship between tax and supply of structure space. I reconstructed the data with the raw data from KOSIS and the time period for the collected data ranges from 2001 to 2009. I separated the period by two before and after 2005 for house and derived the differences between each period. I used differenced data set: 32 observations for residential housing in sixteen different districts from 2001 to 2004 and from 2005 to 2009, respectively. The reason I separated residential housing from commercial building is the available data set was different and for the house, I tried to see if the changed real estate tax policy[24] in South Korea since 2005 has a significant effect on the supply of structure space that is consisted of commercial building and housing.

[22] http://www.kosis.kr/

[23] Refer to 'Data Analysis' part

[24] Integrated tax on house and land or split tax on both.

B. Data Description

The relationship will be displayed in two ways: first, the relationship between spatial area of commercial building and the area of its land; second, the relationship between spatial area of residential housing and the area of its land. To show it, first of all, variables for the relationship have to be set. For the commercial building, the statistics describe the spatial area of the building and land for it. By the year 2004, the government taxes on residential building and its land separately; however, from the year of 2005, the government taxes on residential building and land at the same integrated tax rate. And plus, since 2005, the tax item has been changed as well. Thus, I used the area of land as the sum of area of the vacant land and cartilage; instead of cartilage which had used by 2004. Since 2005, the collected data of commercial building was not changed and only reports on commercial building excluding residential housing. Thus, there was no reason to reconstruct the data. But unfortunately, the data from 2005 to 2009 does not contain cartilage of the commercial building so only the spatial area of the commercial building was available. Summing up the whole story of how the data was collected and reconstructed is summarized below as <Table 1>. The restructured data is summarized in <Table 2> Spatial Area of Commercial Building and Tax Ratio of Commercial Building to Land.

<Table 1> Data Availability before and after 2005[25]

		2001-2004	2005-2009
Commercial building	Land Area	Available	Available
	Building Area	Available	Available
	Tax on Land	N/A	Available
	Tax on Building	Available	Available
Residential Housing	Land Area	Available	Available
	Building Area	Available	Available
	Tax on Land	N/A	Available[26]
	Tax on Building	Available	

[25] N/A data is because it was not separately reported.

[26] Land and housing are applied at the same tax rate.

<Table2> Spatial Area of Commercial Building and Tax Ratio of Commercial Building to Land

No	Classification	Variables	2005	2006	2007	2008	2009
1	Seoul	Building to land area ratio	2.71	2.97	3.03	3.04	3.14
		Building to land tax ratio	0.82	0.84	0.81	0.82	0.80
2	Busan	Building to land area ratio	2.30	2.99	3.10	2.97	2.95
		Building to land tax ratio	1.01	0.72	0.78	0.85	0.84
3	Daegu	Building to land area ratio	1.54	1.72	1.96	1.99	2.01
		Building to land tax ratio	1.07	1.11	0.96	0.93	0.90
4	Incheon	Building to land area ratio	1.88	1.80	1.76	1.69	1.74
		Building to land tax ratio	1.08	1.07	0.97	0.99	0.96
5	Gwangju	Building to land area ratio	2.62	1.14	1.76	1.83	1.88
		Building to land tax ratio	1.03	0.99	0.93	0.93	0.89
6	Daejeon	Building to land area ratio	3.24	1.99	1.96	1.94	2.01
		Building to land tax ratio	0.97	0.99	0.86	0.87	0.86
7	Ulsan	Building to land area ratio	2.25	2.13	1.90	1.77	1.80
		Building to land tax ratio	1.03	1.03	1.03	1.05	1.01
8	Kyunggi	Building to land area ratio	2.12	1.50	1.33	1.15	1.16
		Building to land tax ratio	1.06	1.02	1.21	0.95	0.94
9	Gangwon	Building to land area ratio	1.04	0.78	0.72	0.36	0.29
		Building to land tax ratio	1.25	1.27	1.03	1.10	1.09
10	Chungbuk	Building to land area ratio	1.58	1.42	1.21	0.91	0.57
		Building to land tax ratio	1.18	1.08	1.31	1.36	1.41
11	Chungnam	Building to land area ratio	1.56	1.42	1.32	0.76	0.64
		Building to land tax ratio	1.73	2.01	1.57	1.54	1.45
12	Jeonbuk	Building to land area ratio	1.55	1.42	1.00	0.82	0.73
		Building to land tax ratio	1.60	1.51	1.57	1.39	1.38
13	Jeonnam	Building to land area ratio	1.46	1.50	1.11	0.85	0.74
		Building to land tax ratio	1.50	1.45	1.37	1.29	1.28
14	Gyeongbuk	Building to land area ratio	1.70	1.43	1.24	1.04	0.93
		Building to land tax ratio	1.40	1.45	1.34	1.32	1.29
15	Gyeongnam	Building to land area ratio	2.42	1.99	1.59	0.82	0.75
		Building to land tax ratio	1.19	1.27	1.10	1.09	1.09
16	Jeju	Building to land area ratio	0.71	0.79	0.64	0.58	0.58
		Building to land tax ratio	1.24	0.88	0.87	0.90	0.86

Source: Korea Statistical Information Service[27]

[27] Reproduced by the author.

For the housing, the area of residential housing was investigated with the tax amount and tax base; however, the size of land was measured differently in the two periods.[28]. But there was no information about tax in cartilage area of residential housing. I used effective tax ratio between building and land for residential housing and the area of both. On the other hand, for the commercial building, I could get all the information that I needed: residential building area and cartilage area with the effective tax ratio at the same time. The calculated data is summarized in <Table 3> Spatial Area Ratio of Residential Building to Land and Tax Rate on Residential building.

[28] The problem was solved by adding vacant land to cartilage in second period 2005~2009 so as to make it parallel with the first period 2001~2004.

<Table 3> Spatial Area Ratio of Residential Building to Land and Tax Rate on Residential building

Classification	Variable	2001	2002	2003	2004	2005	2006	2007	2008	2009
Seoul	B/L ratio	1.297	1.513	1.666	1.725	1.762	2.106	1.773	1.943	1.968
	Tax rate[29]	0.416	0.442	0.459	0.490	0.121	0.094	0.106	0.209	0.151
Busan	B/L ratio	1.241	1.288	1.456	1.498	1.229	1.345	1.488	1.577	1.538
	Tax rate	0.344	0.344	0.367	0.373	0.163	0.162	0.164	0.143	0.104
Daegu	B/L ratio	1.260	1.377	1.349	1.603	0.872	0.935	1.210	1.415	1.443
	Tax rate	0.404	0.395	0.372	0.351	0.178	0.164	0.159	0.150	0.102
Incheon	B/L ratio	0.910	0.995	1.047	1.129	1.128	1.214	1.267	1.237	1.200
	Tax rate	0.343	0.345	0.352	0.341	0.174	0.168	0.153	0.135	0.106
Gwangju	B/L ratio	1.179	1.034	1.061	1.286	0.586	0.674	1.179	1.222	1.275
	Tax rate	0.349	0.340	0.349	0.327	0.149	0.131	0.137	0.131	0.095
Daejeon	B/L ratio	0.878	0.968	1.109	1.166	1.081	1.170	1.151	1.365	1.389
	Tax rate	0.368	0.370	0.377	0.380	0.165	0.151	0.158	0.153	0.103
Ulsan	B/L ratio	0.637	0.727	0.757	0.817	0.796	0.628	0.811	1.040	1.079
	Tax rate	0.337	0.309	0.316	0.401	0.147	0.141	0.125	0.128	0.097
Kyunggi	B/L ratio	0.927	1.170	0.786	0.949	0.742	0.680	0.811	1.018	1.023
	Tax rate	0.371	0.358	0.429	0.424	0.129	0.115	0.100	0.106	0.096
Gangwon	B/L ratio	0.330	0.323	0.334	0.355	0.200	0.224	0.397	0.450	0.427
	Tax rate	0.308	0.322	0.318	0.318	0.152	0.133	0.134	0.112	0.092
Chungbuk	B/L ratio	0.217	0.280	0.251	0.352	0.249	0.692	0.478	0.430	0.460
	Tax rate	0.347	0.337	0.340	0.317	0.151	0.130	0.132	0.125	0.109
Chungnam	B/L ratio	0.216	0.236	0.237	0.243	0.236	0.262	0.460	0.311	0.337
	Tax rate	0.328	0.321	0.325	0.327	0.150	0.142	0.139	0.133	0.095
Jeonbuk	B/L ratio	0.289	0.309	0.315	0.324	0.297	0.292	0.361	0.380	0.417
	Tax rate	0.397	0.341	0.331	0.321	0.136	0.131	0.144	0.121	0.093
Jeonnam	B/L ratio	0.184	0.197	0.176	0.234	0.248	0.201	0.240	0.284	0.294
	Tax rate	0.331	0.348	0.334	0.320	0.134	0.136	0.123	0.115	0.088
Gyeongbuk	B/L ratio	0.213	0.228	0.267	0.281	0.285	0.323	0.312	0.340	0.356
	Tax rate	0.338	0.341	0.326	0.312	0.145	0.140	0.131	0.115	0.092
Gyeongnam	B/L ratio	0.365	0.387	0.334	0.415	0.271	0.377	0.774	0.558	0.571
	Tax rate	0.333	0.337	0.328	0.360	0.161	0.146	0.138	0.121	0.095
Jeju	B/L ratio	0.292	0.285	0.293	0.294	0.243	0.173	0.361	0.431	0.373
	Tax rate	0.429	0.340	0.326	0.334	0.164	0.139	0.137	0.090	0.091

Source: Korea Statistical Information Service[30]

[29] Tax amount/Tax base, measured by percentage point (%)

[30] Reproduced by the author

IV. Methodology

A. Basic Model for Housing and Commercial Building

The analysis will be done in two ways; one for housing and the other for commercial building. As already mentioned, due to the limitation of data collection, I set two different models; however, they are basically almost identical. Using differenced data, the fixed effect model is applied because each of the cities and provinces has unique and rarely changing features.

The housing model is as following:

$$\frac{\text{Structure area}}{\text{Land area}} = f(t_S, X; \beta_i, \alpha_i, u_i), (i=0,1,2,3)$$

For the commercial building:

$$\frac{\text{Structure area}}{\text{Land area}} = h(t_S/t_L, X; \beta_i, \alpha_i, u_i), (i=0,1,2,3)$$

where, t_S= tax on structure

t_L= tax on land

β_i= parameters

α_i= unobserved effect (cities and provinces heterogeneity)

u_i = idiosyncratic error

B. Hypothesis to Test

As it has shown so far, tax is likely to shrink economic activities and also construction activities as well. To see if tax rate affect the capital intensity, the hypothesis is set as below.

For the housing model:

$$H_0: \frac{\partial(S/L)}{\partial(t_S)} < 0$$

For the commercial building:

$$H_0: \frac{\partial(S/L)}{\partial(t_S/t_L)} < 0$$

Therefore, if the hypothesis is rejected, we can say that the tax amount in housing and the tax ratio in commercial building are statistically significant. The numerator and the denominator move to the same direction if and only if $\frac{\partial(S/L)}{\partial(t_S/t_L)}$ or $\frac{\partial(S/L)}{\partial(t_S)}$ are positive and otherwise, vice versa.

V. Data Analysis

A. Changes in Capital Intensity

In order to review what impact has been occurring between capital intensity and tax rate for residential housing, tax rate for residential housing is set as an independent variable and residential housing structure to land ratio is set as a dependent variable to measure capital intensity. Due to the inconsistency of statistical data by the significant change in real estate tax system since 2005, the slope between two points; which is the differences in the first period (from 2001 to 2004) and that in the second period (from 2005 to 2009), will be calculated for the housing. In order to do so, the tax rate on residential housing and the area ratio of residential housing to land for cities and provinces was computed during the two periods. The result of calculation is summarized as <Table 4>. Eleven out of sixteen has negative relationships between area ratio and tax rate; on the other hand, five out of sixteen have positive relationships. Among the eleven districts, six of them are included in the major cities and five are from provinces.

<Table 4> The Impact of Revised Tax System on Capital intensity for Housing

Classification	Variables	Average 2001-2004	Average 2005-2009	$\frac{\Delta \text{area ratio}}{\Delta \text{building tax rate}}$
Seoul	Housing/land	1.55	1.81	-0.836
	Building tax rate(%)	0.452	0.136	
Busan	Housing/land	1.37	1.38	-0.053
	Building tax rate	0.357	0.147	
Daegu	Housing/land	1.40	1.19	0.902
	Building tax rate	0.381	0.151	
Incheon	Housing/land	1.02	1.13	-0.552
	Building tax rate	0.345	0.147	
Gwangju	Housing/land	1.14	0.90	1.118
	Building tax rate	0.341	0.128	
Daejeon	Housing/land	1.03	1.13	-0.444
	Building tax rate	0.374	0.146	
Ulsan	Housing/land	0.73	0.75	-0.07
	Building tax rate	0.341	0.128	
Kyunggi	Housing/land	0.96	0.79	0.588
	Building tax rate	0.396	0.109	
Gangwon	Housing/land	0.34	0.28	0.299
	Building tax rate	0.317	0.125	
Chungbuk	Housing/land	0.27	0.39	-0.542
	Building tax rate	0.335	0.13	
Chungnam	Housing/land	0.23	0.24	-0.061
	Building tax rate	0.325	0.132	
Jeonbuk	Housing/land	0.31	0.31	0.01
	Building tax rate	0.348	0.125	
Jeonnam	Housing/land	0.20	0.21	-0.08
	Building tax rate	0.333	0.119	
Gyeongbuk	Housing/land	0.25	0.29	-0.205
	Building tax rate	0.329	0.125	
Gyeongnam	Housing/land	0.38	0.35	0.125
	Building tax rate	0.34	0.132	
Jeju	Housing/land	0.29	0.25	0.174
	Building tax rate	0.357	0.124	

Source: Korea Statistical Information Service[31]

[31] Reproduced by the author.

B. Factors that Affect Capital Intensity

To see the relationship between building to land tax ratio and the other factors[32], first of all, the time series is divided by two periods. The area is separated as seven major cities[33] and the nine other provinces[34]. The time period is divided before and after 2005[35] for residential housing and for the commercial building, the data was used from 2005 to 2009. The independent variables are different in housing and commercial building because housing is more likely to be affected by regional factor and also consumer's behavior or expectation.

[32] Regional GDP, housing price index, and population density

[33] Seoul, Busan, Daegu, Incheon, Gwangju, Daejeon, Ulsan

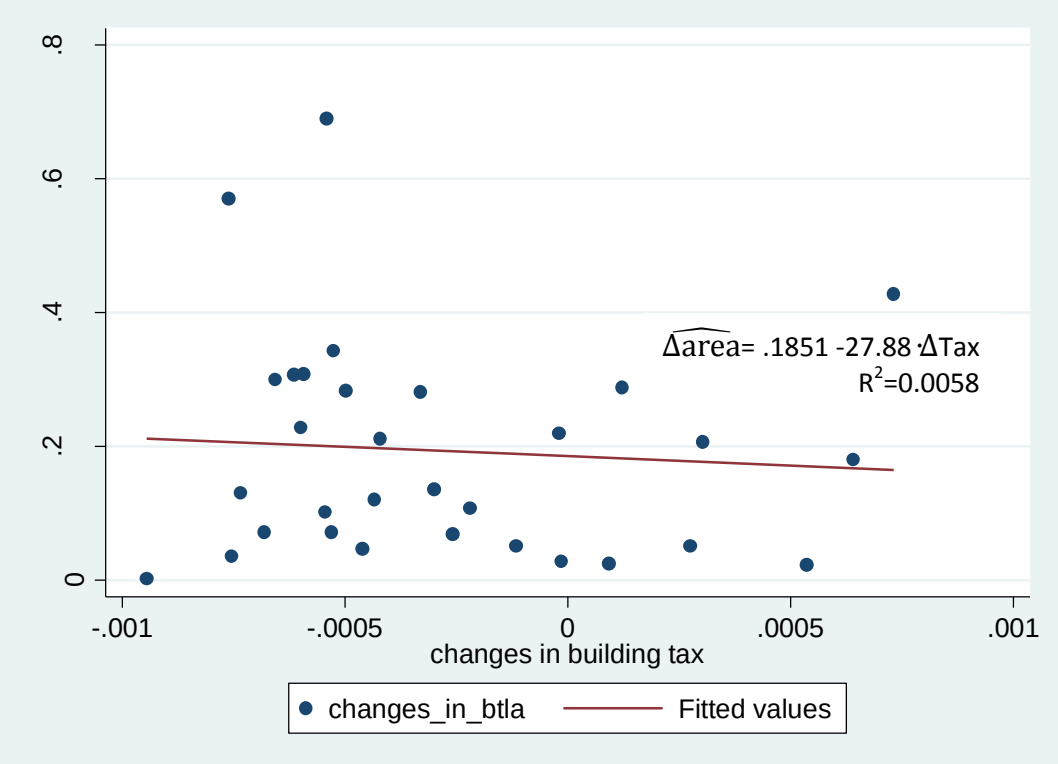
[34] Kyunggi, Gangwon, Chungbuk, Chungnam, Jeonbuk, Jeonnam, Gyeongbuk, Gyeongnam, Jeju

[35] Due to the unavailability of housing price index for provinces, before 2005 is constructed with only two years data.

1. Case of the Housing

The focus of this paper is to find the effect of tax on the capital intensity, thus the relationship between the two factors is graphically displayed in cities and provinces through <Figure1>. As you can see from the below graph, changes of tax ratio in residential housing to land and changes of spatial area ratio in residential housing to land have a negative relationship.

<Figure1> Changes in capital intensity as changes in building tax ratio residential housing [36]



[36] Changes from 2001 to 2004 and from 2005 to 2009, respectively

2. Regression Result for the Housing

The regression equation for the fixed effect of housing is as following:

$$\Delta btla_{it} = \beta_0 + \beta_1 \cdot \Delta btax_{it} + \beta_2 \cdot \Delta popdens_{it} + \beta_3 \cdot \Delta rgdpcapita_{it} + \alpha_i + u_{it},\ (i=1,2,\cdots,16;\ t=1,2)$$

where,

$\Delta btla$ = changes in area ratio

as an indicator of capital intensity on land: $\frac{\text{structure area}}{\text{land area}}$

$\Delta btax$ = changes in tax on structure

$\Delta popdens$ = changes in population density

$\Delta rgdpcapita$ = changes in regional GDP per capita

α_i = unobserved effect (cities and provinces heterogeneity)

u_{it}= idiosyncratic error

And the fitted equation is

$$\widehat{\Delta btla} = \underset{(0.088)}{0.134} - \underset{(87.07^*)}{177} \cdot \Delta btax - \underset{(.0009)}{.0014} \cdot \Delta popdens + \underset{(.0324)}{.0085} \cdot \Delta rgdpcapita$$

*:10% significance level

The coefficient of $\Delta btax, \Delta popdens$ and $\Delta rgdpcapita$ do not show statistically significant relationship at the conventional level except for $\Delta btax$ and its p-value is 0.062. Thus, we can say that the residential building's spatial area ratio decreases $177m^2$ as the

building tax increases by 1%. Although it is not quite significant, the coefficient of population density has a p-value of 0.159. Therefore, either relatively more tax on building or less tax on land induces low level of the residential housing's spatial area on the same size of land and the population density has a bit of impact on capital intensity.

I estimated the value using different independent variables; for example, using only residential housing tax, residential housing tax and population density or residential housing tax and regional GDP per capita.

The results are:

$$\widehat{\Delta \text{btla}} = 0.157 - 133.4402 \cdot \Delta \text{btax}$$
$$(0.032^{***}) \quad (78.97)$$

$$\widehat{\Delta \text{btla}} = 0.155 - 170.06 \cdot \Delta \text{btax} - .0013 \cdot \Delta \text{popdens}$$
$$(0.031^{***}) \quad (79.44^{**}) \quad (.0009)$$

$$\widehat{\Delta \text{btla}} = 0.161 - 132.35 \cdot \Delta \text{btax} - .0015 \cdot \Delta \text{rgdpcapita}$$
$$(0.090) \quad (85.15) \quad (.033)$$

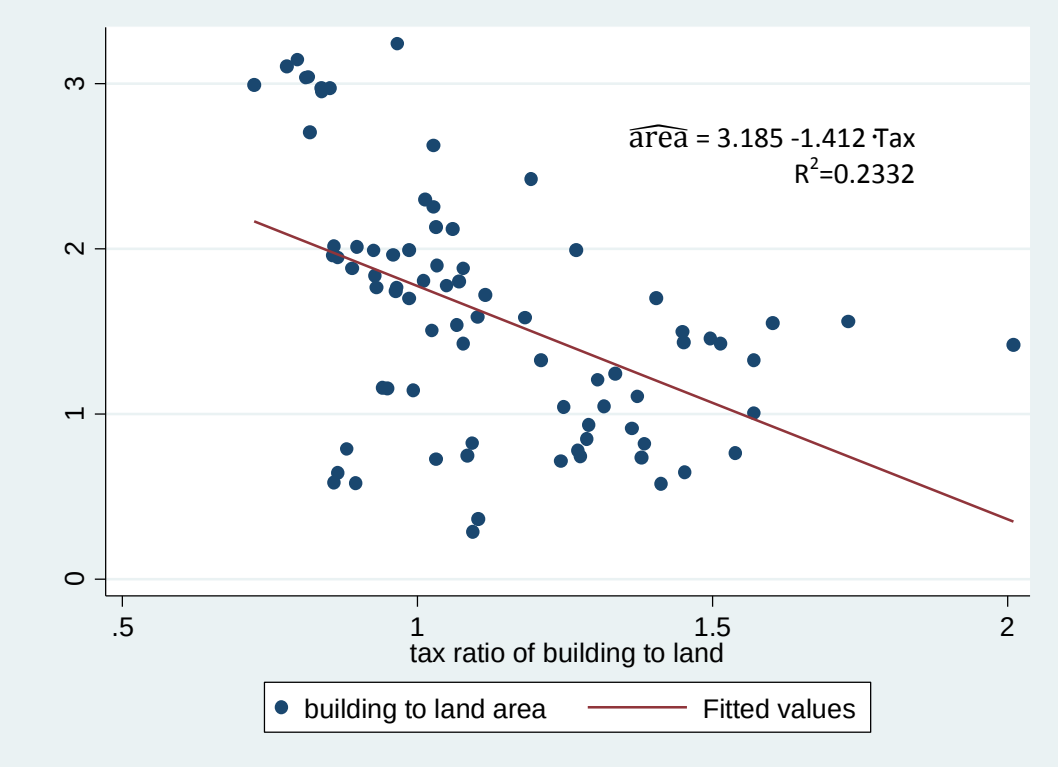
**: 5% significance level

***: 1% significance level

3. Case of the Commercial Building

The <figure2> below shows that the relationship between capital intensity and tax ratio. And it seems like to have overall negative relationship. For the commercial building, taller commercial building is more likely to be located in the place where the bigger size of regional GDP and higher population density are due to the profitability.

<Figure2> Tax ratio and capital intensity of commercial building, 2005 ~ 2009



4. Regression Result for the Commercial Building

The regression equation for the fixed effect commercial building is:

$$btla_{it} = \beta_0 + \beta_1 \cdot btlt_{it} + \beta_2 \cdot popdens_{it} + \beta_3 \cdot rgdp_{it} + \alpha_i + u_{it} \quad (i=1,2,\cdots,16;\ t=1,2,3,4,5)$$

where,

btla = commercial building's spatial area ratio[37]

btlt = commercial building's tax ratio[38]

popdens = population density

rgdp = regional GDP

α_i = The unknown intercept for each observation, (i=1….n)

And the fitted equation of it is

$$\widehat{btla} = 2.237 - .748 \cdot btlt - .0001 \cdot popdens - .00091 \cdot rgdp$$
$$(0.324^{***}) \quad (.271^{***}) \quad (.00002^{***}) \qquad (.0013)$$

***:1% significance level

The coefficient of btlt and popden show statistically significant relationships at the conventional 1% level and its p-value is 0.007 and almost 0, respectively. Thus, the commercial building's spatial area ratio decreases 0.748 as the building to land tax ratio

[37] $\frac{\text{structure area}}{\text{land area}}$

[38] $\frac{\text{structure tax rate}}{\text{land tax rate}}$

increases by 1 and thousand additional persons per squared kilometer decreases the commercial building's spatial area ratio by 0.1. On the other hand, 1 trilion won of regional GDP growth decreases by 0.00091 of the commercial building's spatial area ratio; however, it is not significant at the conventional level.

The result says that either more tax on building or less tax on land induces low level in the ratio of the commercial building's spatial area on the same size of land. However, higher regional GDP encourages the commercial building's spatial area on the same size of land with very low confidence level, so the effect is ambiguous. On the other hand, population density increases the commercial building's spatial area on the same size of.

VI. Implication

From the data analysis of housing, residential housing to land tax ratio has a negative effect on capital intensity. For commercial building, on the other hand, it is revealed that building tax rate and population density have negative correlation with the supply of commercial building's spatial area; however, regional GDP has a positive relationship with it.

A. Taxation on Residential Housing

In case of housing, higher tax ratio is interpreted as bringing lower capital intensity. It is consistent with the view of economics: tax is harmful to produce and price determines supplied quantity. Increasing tax on the improvement causes lower capital intensity which means low building to land ratio.

B. Taxation on Improvement in Commercial Building

For commercial buildings, higher tax ratio brings lower commercial building's spatial area on the same size of land and higher regional GDP has a tendency to increase the supply of commercial building's spatial area on the same size of land. Most of the high GDP producing regions would require more space for producing goods or services; this is the reason for the positive relationship between regional GDP and commercial building's spatial area on the same size of land. Therefore, if the government collects more tax on land and less tax on the improvement, the land price would decrease and construction will be activated.

And of course the government tax revenue would increase. Lastly, population density and its squared number in a commercial building model shows positive relationship and negative relationship, respectively. Because a city or province can bear at a certain number of people; however, after that point the district cannot bear it anymore. As a result, the area of building on the same size of land starts to decrease by enlarging the urban size.

VII. Limitation and Further Studies

A. Limitation

Throughout the study, I faced a little difficulty. First, it was too tough to collect the best suitable data; I could not get the right data because most of the statistical data has been provided as a secondary data. Since 2005, the statistic department seems pay more attention on its data than before; however, it was still not enough to get necessary data. For example, I could not get the real tax rate because the department did not show the price of the houses, buildings, and land in each local.

Second, frequent changes in the real estate tax items; even the officers at the district office were confused and tax payers even do not know why they have to pay that much amount of money as tax. Due to those difficulties, the statistic data here is used under manipulating by the author.[39] Nevertheless, the data was not exaggerated or modified arbitrarily. Thus, the result would be reinforced if the best suitable data is applied.

[39] You may see how I dealt with the data in the 'Data' part of this paper.

B. Further Studies

To conduct more precise study, the classification of the provinces and cities had to be divided as the smallest unit like district or small city. For that, the data from small and medium cities and districts would be necessarily required. On top of that, ordinances from each of the local governments have to be reviewed because the local head officers can increase or decrease its tax rate within 50% by exercising autonomous entity. Therefore, hundreds of local governments will be included as subjects. For that reason, this study considered only seven cities and nine provinces.

VIII. Concluding Remarks

Real estate and its supply and demand are distinguished with the other goods and market due to its characters. Even though the government exercises its authority to collect tax from the people, we could not find any strong consensus regarding how we levy tax on real estate and on what ground the government can do. However, general consensus has already been existed for taxation: the less excessive burden the better tax is. Accordingly, real estate holding tax is better than the transaction tax and levying tax on land is better than that on improvement.

On the ground of that consensus, I performed empirical test on commercial building and housing, respectively. Although individual result is not always significant throughout the whole materials in housing and commercial building, the area of commercial buildings and residential housing on the same size of land tends to increase when either the building to land tax ratio or the tax on residential housing is smaller. In other words, capital intensity is relatively higher when either tax on land increases or tax on the improvement decreases.

In the two-rate tax, the major problem is how to evaluate land value and improvement value, separately. It is impossible to evaluate exactly in what amount of the value comes from land or structure and to capture hundred percent of the land value or the structure; however, approximately it can be estimated by subtracting the value of vacant land from the whole real estate. There would be rare economically perfect policy due to the dead weight loss; nevertheless, policymakers have to implement some policies when they consider those policies are needed. In such case that the policy is more oriented for the general public's interests even though the total benefit is smaller than economically maximized surplus. For example, mail service, railroad, water supply service, and in some extent, housing can be included in that area.

When the government tries to rectify tax system, there would be some resistances. To persuade people who resisting a reformation, the requirement is not a perfect or compact policies design rather than that how instigate the people to understand even though the policy seems to be imperfect in economical sense. With logically perfect and compact designed policy cannot persuade people who just hate or reluctant it, but if it is succeeded to stimulate sympathetic mind of the people, it might be possible to make a reformation.

To summing up, tax policy that encourages supply of construction is not always valid for housing market; however, it worked for commercial building. This is because there are various independent variables in the supply and demand of the housing market, for example, development plan, speculative demand, transportation system, etc. Some of those independent variables are also included in commercial building; however, I assume that the most powerful variable is speculative demand for housing market. Paradoxically, to exclude the influences from the various independent variables[40], the government has to increase real estate holding tax so that the land owners cannot take advantage of the benefits from such public development issues. However, we already know from some empirical evidences that tax on real estate cannot mitigate real estate price but rather raise the price. At this point, split real estate tax is required, which separates land tax and improvement tax from the compounded real estate tax, so that the economy is activated by supply of spatial space and the land price goes down by the land tax. Then, two-rate tax can affect the housing price indirectly by increasing the supply of space and reducing land price, simultaneously.

[40] That is normally related to some lucrative development businesses,

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